SYNTHESIS AND CHARACTERIZATION OF GRAPHENE DOPED BORON NITRIDE NANOSHEETS Mischelle R. Nelson,[1] Kathryn V. Esham,[2] Shena M. Stanley[3], Amartya Chakrabarti[3], Narayan S. Hosmane[3,*]

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Graphene, a material composed of few-layer carbon sheets, has novel properties with unique applications. Its small band gap makes graphene an ideal conductor. Graphene has a wide range of applications including use in sensors, nano electronics and lithium ion batteries. However, superconductivity of graphene restricts its application for specific electronic devices where electrical conductivity needs to be controlled. Moreover, the thermal insulation property of graphene needs to be altered for applications involving heat generation. On the contrary, hexagonal boron nitride (h-BN) is a semiconducting material with high thermal conductivity. Nonetheless, h-BN is isoelectronic with graphene, which makes it a suitable material to be incorporated into graphene. Thus a hybrid nanostructure composed of graphene and h-BN is highly desired

Methods for synthesizing both graphene and h-BN have been developed; including carbon dioxide conversion to graphene and pyrolysis reaction for synthesis of h-BN. The dry ice method, burning magnesium in solid carbon dioxide, is more cost effective than other graphene synthetic methodologies. Non-toxic chemicals are involved in the synthesis when carbon dioxide and magnesium strips are used as starting materials. Pyrolysis of boron and nitrogen containing precursors is a scalable methodology that can be useful for industrial applications. Thus, these methodologies were combined to synthesize h-BN and graphene hybrid nanostructures. The products were characterized via Fourier-Transform Infrared (FT-IR) Spectroscopy, Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), Energy Dispersive Spectroscopy (EDS) and X-Ray Diffraction (XRD) analysis.